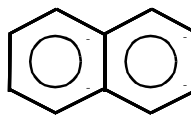


NAPHTHALENE

Naphthalene is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 91-20-3

Molecular Formula: $C_{10}H_8$



Naphthalene is a white crystalline, volatile solid with an odor of mothballs. It sublimates at room temperature. Naphthalene is insoluble in water and is soluble in benzene, absolute alcohol, ether, carbon tetrachloride, carbon disulfide, hydronaphthalenes, and in fixed and volatile oils (Merck, 1989).

Physical Properties of Naphthalene

Synonyms: tar camphor; naphthalin; white tar; naphthene; naphthaline

Molecular Weight:	128.16
Boiling Point:	217.9 °C
Melting Point:	80.2 °C
Flash Point:	174 °F (open cup)
Vapor Density:	4.42 (air = 1)
Density/Specific Gravity:	1.162 at 20/4 °C
Vapor Pressure:	0.082 mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	3.30
Conversion Factor:	1 ppm = 5.24 mg/m ³

(Howard, 1990; Merck, 1989; Sax, 1987; Sax, 1989)

SOURCES AND EMISSIONS

A. Sources

Naphthalene is produced from petroleum refining and coal tar distillation. Naphthalene is used as a chemical intermediate in the production of phthalic anhydride, naphthol, and chlorinated naphthalenes. It is also used in smokeless powder, cutting fluids, lubricants, antiseptics, synthetic resins, tanning products, preservatives, textile chemicals, emulsion breakers, and scintillation counters (Sax, 1987; Howard, 1990). It is also found in combustion processes including refuse combustion, tobacco smoke, coal tar pitch fumes, and oil spills.

The primary stationary sources that have reported emissions of naphthalene in California are paper mills, manufacturers of miscellaneous wood products, and electrical services (ARB, 1997b). Naphthalene has also been detected but not quantified in motor vehicle exhaust by the Air Resources Board (ARB) (ARB, 1995e).

Naphthalene was registered for use as a pesticide; however as of December 31, 1992, it is no longer registered for pesticidal use in California (DPR, 1996).

B. Emissions

The total emissions of naphthalene from stationary sources in California are estimated to be at least 360,000 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Naphthalene is a component of crude oil and is also a product of natural uncontrolled combustion (U.S. EPA, 1994a).

AMBIENT CONCENTRATIONS

No ARB data exist for ambient measurements of naphthalene. However, ambient air sampling was conducted in Redlands, California on selected days and nights from October 19 through 28, 1994. A total of seven 12 hour daytime and six 12 hour nighttime samples were collected. The observed 12 hour average ambient concentrations of naphthalene ranged from 348 to 715 nanograms per cubic meter (ng/m^3) or 0.07 to 0.14 parts per billion (ppb) (Atkinson, 1995).

In addition, the United States Environmental Protection Agency (U.S. EPA) has compiled ambient data from urban and suburban locations throughout the United States. Mean concentrations were reported at $530 \text{ ng}/\text{m}^3$ (0.10 ppb) in 5 urban to suburban locations from 1974-82, $470 \text{ ng}/\text{m}^3$ (0.09 ppb) in Boston during 1990-91, $436 \text{ ng}/\text{m}^3$ (0.08 ppb) in Houston from 1990-91, $530 \text{ ng}/\text{m}^3$ (0.10 ppb) in Chicago during 1991, and $330 \text{ ng}/\text{m}^3$ (0.06 ppb) in Kankakee, Illinois during 1991. The overall concentrations ranged from the limit of detection to $2,560 \text{ ng}/\text{m}^3$ (0.49 ppb) (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of naphthalene was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

Naphthalene exists in the atmosphere in the gas phase. The reaction with the hydroxyl (OH) radical dominates as a naphthalene loss process, leading to a calculated half-life and lifetime of naphthalene due to reaction with the OH radical of 11 hours and 16 hours, respectively. The products of this reaction are 1- and 2-naphthol, 1- and 2-nitronaphthalene (also formed from the nighttime nitrate (NO₃) radical reaction) and ring-opened dicarbonyls (Atkinson, 1995).

AB 2588 RISK ASSESSMENT INFORMATION

The Office of Environmental Health Hazard Assessment reviews risk assessments submitted under the Air Toxics “Hot Spots” Program (AB 2588). Of the risk assessments reviewed as of December 1996, for non-cancer effects, naphthalene contributed to a total chronic hazard index greater than 1 in 15 of the approximately 89 risk assessments. Naphthalene also contributed to a total acute hazard index greater than 1 in 2 of approximately 107 risk assessments (OEHHA, 1996b).

HEALTH EFFECTS

Probable routes of human exposure to naphthalene are inhalation, ingestion, and dermal contact (U.S. EPA, 1994a).

Non-Cancer: Vapors are highly irritating to the eyes and may cause cataracts upon chronic exposure. Acute exposure to naphthalene may cause methemoglobinemia and hemolytic anemia as well as damage to the kidneys. Symptoms may include headache and nausea (U.S. EPA, 1994a). Individuals with glucose-6-phosphate dehydrogenase deficiency may be at increased risk.

A chronic non-cancer Reference Exposure Level (REL) of 14 micrograms per cubic meter is listed for naphthalene in the California Air Pollution Control Officers Association Air Toxics “Hot Spots” Program, Revised 1992 Risk Assessment Guidelines. The toxicological endpoint considered for chronic toxicity is the cardiovascular or blood system (CAPCOA, 1993). The U.S. EPA has not established a Reference Concentration (RfC), and an oral Reference Dose (RfD) for naphthalene is under review (U.S. EPA, 1994a).

Hemolytic anemia has been reported in infants born to mothers who sniffed and ingested naphthalene (as mothballs) during pregnancy (U.S. EPA, 1994a).

Cancer: Di-, tri-, and tetramethyl naphthalene contaminants of coal tar were found to be carcinogenic when applied to the skin of mice, but naphthalene alone was not. The U.S. EPA has placed naphthalene in Group D: Not classifiable as a carcinogen (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified naphthalene for its carcinogenicity (IARC, 1987a).

